LOWER SNAKE RIVER
COMPENSATION PLAN
Hatchery Program

SAWTOOTH FISH HATCHERY
and
EAST FORK SATELLITE

1993 Spring Chinook Brood Year Report
1994 Steelhead Brood Year Report

By

Brent R. Snider
Fish Hatchery Manager II

Kurtis Schilling
Assistant Fish Hatchery Manager

IDFG 98-18
July 1998

Table of Contents

Table of Contents (Cont.)

List of Appendices

List of Appendices (Cont)

List of Appendices (Cont)

ABSTRACT

The Sawtooth Fish Hatchery trap and weir were put into operation on June 18, 1993 and operated through September 6, 1993. A total of 587 spring chinook salmon *Oncorhynchus tshawytscha* (278 males, 280 females, and 29 jacks) were trapped. Released above the weir were 423 fish (207 males, 209 females, and 7 jacks) to spawn naturally. Prespawning mortality of ponded fish totaled three females for a 1.8% prespawning mortality rate.

Spawning began on August 2 and continued through September 2, with ten spawning days total. We spawned 68 females, 71 males, and 22 jacks for 369,340 green eggs (5,431 eggs per female), which yielded 341,641 eyed eggs for an eye-up rate of 92.5%. From these eyed eggs 341,252 fry were ponded, which resulted in a smolt release of 334,313 smolts.

The East Fork Satellite fish trap and velocity barrier were put into operation on June 18, 1993 and was operated through September 6, 1993. A total of 90 spring chinook salmon (52 males, 33 females, 5 jacks) were trapped with 65 fish (39 males, 21 females, and 5 jacks) being released to spawn naturally. There was one female prespawning mortality for a 4.0% mortality rate.

Spawning at the East Fork Satellite started August 11 and continued through September 3, 1993, with five spawning days total. A total of 13 males, 0 jacks, and 11 females were spawned, yielding 59,152 green eggs, for a fecundity rate of 5,377 eggs per female. These green eggs resulted in 52,000 eyed eggs for an eye-up rate of 87.9%. From these eyed-eggs, we ponded 51,162 fry that were reared at Sawtooth Fish Hatchery, with 48,845 smolts planted in the East Fork in April 1995.

Authors:

Brent R. Snider
Fish Hatchery Manager II

Kurtis Schilling
Assistant Fish Hatchery Manager

INTRODUCTION

Funding Source

Sawtooth Fish Hatchery is part of the U.S. Fish and Wildlife Services Lower Snake River Compensation Plan and has been in operation since 1985. The hatchery and satellite facility were built by the Corp of Engineers and is funded through the U.S. Fish and Wildlife Service.

Location

Sawtooth Fish Hatchery is located five miles south of Stanley, Idaho. The facility's 71 acres borders the Salmon River to the west, Highway 75 to the east, and U.S. Forest Service ground to the south and north. The Sawtooth Fish Hatchery weir is roughly 400 miles from Lower Granite Dam and 950 miles from the mouth of the Columbia River. Spring chinook salmon *Oncorhynchus tshawytscha* are released directly into the river at the hatchery and above the hatchery in the headwaters of the Salmon River. Sawtooth Fish Hatchery steelhead *Oncorhynchus mykiss* are released at the hatchery, along the lower Salmon River, and various other drainages around the state.

Sawtooth Fish Hatchery has operated a satellite facility on the East Fork of the Salmon River since 1984. The facility is situated 18 miles upstream on the East Fork Salmon River. The mouth of the East Fork Salmon River is located 42 miles downriver from Sawtooth Fish Hatchery. The property was purchased from the U.S. Bureau of Land Management and is surrounded by private land. An access road easement was purchased from a private landowner who has property surrounding the location. The east side of the property borders the East Fork of the Salmon River. Historically, all East Fork fish have been returned to the East Fork River.

Species Reared

Sawtooth Fish Hatchery is involved in trapping, spawning, and rearing spring chinook salmon to the smolt stage for release. A-run steelhead trout are also trapped and spawned. The steelhead eggs are incubated to eye-up then transferred to other hatcheries for rearing.

The East Fork facility handles spring chinook salmon as well as B-run steelhead trout. The green eggs from fish spawned at the East Fork station are transferred to Sawtooth Fish Hatchery for incubating. The chinook are reared at Sawtooth Fish Hatchery, with the steelhead being transferred as eyed eggs to other hatcheries for rearing.

Broodstock History

Historically, all of the Sawtooth Fish Hatchery and the East Fork trap broodstock have come from the upper Salmon River and the East Fork River, respectively. There was introduction of

Rapid River Hatchery stock at the Sawtooth Fish Hatchery site and in the headwaters of the Salmon River in the late 1970s and early 1980s as fry and smolt plants.

At both facilities returning adult fish are released to spawn naturally. Numbers of fish released depends on how many marked and unmarked fish return. Releases are determined under guidelines spelled out in National Marine Fisheries Service permits # 919 and # 920. Typically at Sawtooth Fish Hatchery, about two-thirds of the unmarked salmon are released. All unmarked steelhead trapped at Sawtooth Fish Hatchery are released. At the East Fork, all salmon are released until a total of 20 pairs have been passed above the weir. All unmarked steelhead trapped at the East Fork are released above the weir to spawn naturally. A historical synopsis of releases and returns is shown in Appendix A.

OBJECTIVES

Mitigation Goals

As part of the Lower Snake River Compensation Plan, Sawtooth Fish Hatchery's mitigation goals are expressed in adult returns of 19,000 adult salmon over Lower Granite Dam.

Idaho Department of Fish and Game Objectives

Idaho Department of Fish and Games' objectives are:

1. To produce 2.4 million smolts for release, of which up to one million of the East Fork-origin smolts will be returned to the East Fork of the Salmon River vicinity.
2. Produce quality fish for supplementation programs.
3. Implement research programs at the hatchery to improve returns to the hatchery.

FACILITY DESCRIPTION

Hatchery Description

The hatchery's main building is 134 ft by 166 ft and consists of an office, meeting room, lab, visitor/interpretive center, wood shop, welding/fabrication shop, intake collection box/chemical room, shop office, incubation and early rearing room, one inside storage room and two outside covered storage areas, generator room, furnace room, and a feed freezer/chemical equipment room. The hatchery has four pump houses (each is 14 ft x 11 ft), of which one is for domestic water and three are production wells. An intake building (15 ft x 37 ft) is located one-half mile upstream from the hatchery, and Salmon River water is collected for outside production rearing. The temporary employee dorm and adult spawning facility are located 300 yards downstream of

the hatchery building. The dorm (38 ft x 72 ft) has three bedrooms with a bath in each, attached public rest-room facilities, storage and laundry room, living and dining room with an open kitchen. The adult facility consists of three adult ponds and an enclosed spawning shed (35 ft x 52 ft). There are five resident houses at Sawtooth Fish Hatchery, all about 1,360 square ft with attached single-car garages and separate woodsheds.

The East Fork facility has a roof structure over a 28 ft travel trailer that is used as a residence while the trap is in operation. The other building is a combination shop, storage, and spawning shed (22 ft x 44 ft).

Production Capabilities

Production capacities at the East Fork trap consists of two 68 ft x 10 ft x 4.5 ft adult holding ponds (3,060 cf) and a 10 ft x 17 ft fish trap. No fish are reared at this facility. All green eggs are shipped to Sawtooth Fish Hatchery.

Production capacities for Sawtooth Fish Hatchery include 100 stacks of FAL incubators containing 800 trays with the potential to incubate five million chinook eggs or seven million steelhead eggs. Inside rearing consists of 16 semi-square tanks with an individual volume of 17 cf and a capacity of 15,000 swim-up fry each, 14 inside rearing tanks with an individual volume of 50 cf and a capacity for 30,000 fry each, and 12 inside rearing vats with an individual volume of 391 cf and a capacity for 100,000 fry each. Outside rearing consists of 12 fry raceways each with 750 cf of rearing space and 28 production raceways each with 2,700 cf of rearing space. Each production raceway has a capacity to raise 100,000 chinook to smolt stage for a total capacity of 2.8 million fish. These production raceways are serial reuse that flow from an upper raceway to a lower one.

The adult facility has three concrete adult fish holding ponds with 4,500 cf of holding area. Each pond can hold approximately 1,300 adults.

RECOMMENDATIONS

Recommendations for Sawtooth Fish Hatchery include developing additional wells for disease-free rearing water, modifying the river water intake to reduce winter icing problems, repairing gabiens at the weir and intake, and seal coating the roadways.

East Fork recommendations include developing separate holding ponds for smolt acclimation, modifying the intake screen to exclude fish fry, and modifying the velocity barrier to prevent injury to migrating fish.

WATER SUPPLY

Source

Sawtooth Fish Hatchery receives fish-culture water from the Salmon River and two production wells. Rearing water from the river enters an intake structure located one-half mile upstream from the hatchery building, and flows through a 54-inch pipe to a control box located in the hatchery building for final screening. This water is then distributed to the indoor vats, outside raceways, or adult fish facility. Incubation and early-rearing water is provided by two production wells. Excess well water is spilled into the control box for use in the outside raceways. A third well provides tempering water introduced at the river intake to reduce winter icing problems.

The East Fork trapping site receives water from the East Fork of the Salmon River via gravity-flow piping throughout the holding ponds. No fish are reared there.

Quantity and Temperature

The wells provide 3.1 cubic feet per second (cfs) of pumped water and temperatures range from 39°F (4°C) in the winter to 52°F (11 °C) in the summer. The river provides up to 55 cfs of gravity-flow water and ranges in temperature from 32°F (°C) in the winter to 68°F (20°C) in the summer (Appendix U.).

Water Quality

The most recent water quality analysis from the collection box at the river was completed in June 1993. Results include hardness at 68 mg/L; total alkalinity as CaCO3 at 74; bicarbonate alkalinity as CaCO3 at 74; specific conductance at 157 (umhos/cm); total ammonia as N at 0.043 (mg/L); total NO2 + NO3 as N at 0.073; total Kjeldahl N as N at <0.05 (mg/L); total phosphorus as P at <0.05 (mg/L); ortho phosphate as P at 0.019; and pH at 8.0. The most noticeable variances from the 1985 tests were ortho-phosphate, which was <.003 mg/l in 1985 to .019 mg/l in 1993 and iron, which was 120 ug/l in 1985 to 20 ug/l in 1993 (Appendix B).

STAFFING

Five permanent personnel are stationed at Sawtooth Fish Hatchery; a Hatchery Manager II, an Assistant Hatchery Manager, a Utility Craftsman, and two Fish Culturists.

The temporary employee staffing includes 8 months of Fishery Technician time, 42 months of Biological Aide time, and 27 months of Laborer time.

FISH HEALTH

Diseases Encountered and Treatment

No major disease problems were encountered with any of the brood year BY93 Sawtooth Fish Hatchery spring chinook (Appendix C).

Important pathogens found at Sawtooth Fish Hatchery are *Renibacterium salmoninarum* (BKD), *Myxobolus cerebralis* (whirling disease), *Diplostomum spp.* (eye fluke), and *Cytophaga psychrophilia* (Cold Water Disease). Both *Myxobolus* and *Diplostomum* have been controlled with concrete raceways. Although *Cytophaga is* ubiquitous in the environment, Cold Water Disease is not expressed at this hatchery unless stressful conditions predispose the fish to disease. In times of warm-water temperatures or handling, some fish will show the typical signs of this disease.

The focus of the fish health program at Sawtooth Fish Hatchery is control of BKD. In 1993, protocols stated in the Investigational New Animal Drug (INAD) 4333 for Sawtooth Fish Hatchery call for a 21-day treatment for production fish and a 28-day treatment for high BKD segregation groups. In the future, erythromycin feeding strategies will include protocols which might enhance absorption of the drug.

Several programs are being implemented at Sawtooth Fish Hatchery to help raise a better quality smolt. Outside raceway baffles were tested with two raceways and shade-cover was installed on all the outside raceways. A BKD segregation program was implemented at this hatchery in 1989, with apparent success in limiting mortalities to high BKD raceways (91-153 & 91-154).

A small group of surplus BY93 Rapid River stock chinook was held at Sawtooth Fish Hatchery until smolt stage for experimental rearing. The experiments focused on subjecting the fish to handling stress to try and mimic the "flag tail" outbreak found in the BY92 spring chinook reared at Sawtooth Fish Hatchery. A summary of the experiment can be found later in this report.

FISH PRODUCTION

Spring Chinook Adult Collection

The Sawtooth Fish Hatchery chinook-trapping season began on June 18, 1993 and continued through September 6, 1993. The peak of the run occurred during the second week of July until August 1 (Appendix V). A total of 587 spring chinook salmon were trapped including 278 males, 280 females, and 29 jacks (Appendix N). Released above the weir were 423 salmon, which included 207 males, 7 jacks, and 209 females (Appendix 0). Eighty-six of these fish were used for adult supplementation plants, and two adults died at release. Tagged fish recoveries included 50 adipose clips (AD) and one right ventral (RV) clip, 66 coded-wire tags (CWT), and 15 left ventral (LV) clips.

The East Fork trap was in operation from June 18, 1993 to September 6, 1993. East Fork's run peaked the third week of August (Appendix W). The East Fork facility trapped 90 spring chinook salmon of which 52 were males, 5 were jacks, and 33 were females (Appendix N). Released above the weir were 65 salmon including 39 males, 5 jacks, and 21 females (Appendix 0). East Fork tagged recoveries included three CWT's and three AD clips.

Sawtooth Fish Hatchery had a male:female ratio of 53% males and 47% females. The East Fork's male:female ratio was 64% male and 36% female.

The CWT recoveries indicated 21 three-year-old, 18 four-year-old, and 27 five-year-old fish returned to Sawtooth Fish Hatchery. East Fork CWT recovery indicated three five-year-old fish (Appendix I).

Adult Treatments

Sawtooth Fish Hatchery and East Fork adult chinook were injected with erythromycin phosphate at a rate of 20 mg active per kg body weight. Injections were given in the dorsal sinus. The Sawtooth Fish Hatchery ponded adults were treated three times per week in a one-hour 175 ppm formalin flush. The East Fork ponded adults were treated with the same flush at a 100 ppm rate.

Prespawning Mortality

Sawtooth Fish Hatchery had three pre-spawning mortalities of ponded fish for a 1.8% mortality rate. A total of three females died prior to spawning at Sawtooth Fish Hatchery. The East Fork had one pre-spawn mortality for a 4.0% mortality rate.

Spawning Operations

Spawning activities at Sawtooth Fish Hatchery began August 2 and concluded September 2, 1993. The ten egg takes during this period yielded 369,340 green eggs from 68 females for an average fecundity of 5,431 eggs per female. There were 71 male and 22 jack salmon used for fertilization. Each female's eggs were separated into half and fertilized by two separate male salmon. Then the eggs were recombined and water-hardened for one hour in a 100 ppm iodine solution. The eggs were then put into Heath incubator trays, with one female per tray for BKD segregation.

Spawning activities at the East Fork fish trap began August 11 and concluded September 3, 1993. The five egg takes during this period yielded 59,152 green eggs from 11 females for an average fecundity of 5,377 eggs per female. There were 13 male salmon used for fertilization. Each female's eggs were separated into thirds and fertilized by three separate male salmon. Then the eggs were recombined and water-hardened for one hour in a 100 ppm iodine solution, and transported to Sawtooth Fish Hatchery to be put into Heath incubator trays, with one female per tray for BKD segregation.

At Sawtooth Fish Hatchery, three spawned females had a high incidence of BKD, while four spawned females at the East Fork had a high incidence of BKD. All of the Sawtooth Fish Hatchery high incidence BKD eggs were reared isolated from the production eggs. The high incidence BKD East Fork eggs were combined with the other East Fork eggs. (The East Fork group was treated as if all were high incidence BKD).

Incubation

Each eight-tray Heath stack had flows set at five gpm of well water. Eggs were incubated at one female per tray for BKD segregation. This averaged about 45 oz, or approximately 5,200 eggs per tray. All incubated eggs were treated with a 1,667 ppm formalin bath for 15 minutes starting three days after fertilization at five times per week for fungal control.

Well temperatures ranged from 47°F to 39°F during the incubation period. The eggs eyed-up at 550 to 600 thermal units (TU). At eye-up the eggs are shocked by dropping them from one container to another, picked with an electronic sorter, and enumerated with an electronic counter. The eggs are shocked at 600 TU and hatch around 1,300 TU.

Sawtooth Fish Hatchery green eggs eyed up at a 92.5% rate, yielding 341,641 eyed eggs. East Fork green eggs eyed up at a 87.9% rate, yielding 52,000 eyed eggs. (Appendix D)

Early Rearing

The swim-up fry were transferred from the Heath trays to epoxy-painted cement vats for early-rearing in December through mid-January. The vats contained PVC baffles every four feet. The vats are 4 ft wide x 3 ft deep x 40 ft long, with key-ways to allow lengths of either 10 ft, 20 ft, or 40 ft, thus creating rearing volumes of 120, 240, or 480 cf.

The swim-up fry were kept at a high density during feed training (1.2 lbs/cf) until all the fish were on feed. After all the fish were eating well, rearing volumes were increased and densities decreased to 0.15 lbs/cf. The fingerlings were moved to the final rearing raceways when densities began to approach 0.8 lbs/cf.

Starting flows for the swim-up fry were set at 20 gpm per vat. As the fish grew, the flows were increased to a maximum of 110 gpm. Early-rearing well water varied in temperature from 44°F at swim-up to a low of 39°F and a high of 47°F when the fish were moved to the final rearing raceways.

All fry were started on Bio-Products Bio-Diet Starter #2 and #3. Feed amounts and sizes varied according to manufacturer recommendations as the fish grew. All fish were fed a prophylactic treatment of erythromycin from mid-March to mid-June at a rate of 4.5 grams active/100 lbs of fish (Appendix P). The fish were transferred to the final rearing raceways around 60 fpp during late July and early August.

Final Rearing

The outside raceways are cement, measuring 12 ft wide x 2.3 ft deep x 100 ft long, yielding 2,700 cf of rearing space. Starting densities outside averaged 0.15 Ibs/cf. Initial flows were set at 500 gpm per raceway and increased to 1,000 gpm during the summer. River water supplies the outside raceways, so daily temperatures fluctuate up to 19°F. Seasonal variances range from lows of 32°F during winter to 69°F in summer.

All outside fish were fed a diet of BioProducts Grower feed. The same fish were fed a 21-day prophylactic treatment of erythromycin at a rate of 4.5 grams active per 100 pounds of fish to prevent the onset of BKD. The high BKD fish were fed a 28-day treatment of erythromyicin.

The finish weight of released BY93 Sawtooth Fish Hatchery spring chinook salmon smolts was 13,995 pounds. The finish weight of released BY93 East Fork spring chinook salmon smolts was 1,920 Ibs. The fish were fed 23,654 pounds of feed for a conversion of 1.5 (Appendix E).

Fish Marking

Fish marking occur[r]ed during the first week of May 1994. There were 392,086 fish marked. Sawtooth Fish Hatchery stock had 25,555 production group fish that received coded-wire tag (CWT) with an adipose (AD) fin clip, which were released into the West Fork of the Yankee Fork in October 1994. Another Sawtooth Fish Hatchery stock production group of 76,864 received CWT and an AD clip and were released in early April 1995. A Sawtooth Fish Hatchery stock reserve group of 28,123 with high BKD received CWT, an AD clip, and a left ventral (LV) clip and were released in April 1995. A Sawtooth Fish Hatchery stock supplementation group of 210,436 received CWT and a right ventral (RV) clip. There were 105,452 released in October 1994, and the remaining 100,141 were released in late March 1995.

East Fork stock had a supplementation group of 32,065 that received CWT and an LV clip which were released into the East Fork Salmon River in late March 1995. Another East Fork stock group of 19,043 with high BKD was released at the East Fork trap in early April 1995.

Sawtooth Fish Hatchery stock received 4,100 Passive Integraded Transponder (PIT) tags and the East Fork stock 500 PIT tags. The PIT tags are to evaluate downriver migration. A summary of marking is shown in Appendix Q and broken down further in Appendix F.

Fish Distribution

Fish release for Sawtooth Fish Hatchery stock BY93 smolts occurred in October 1994 and late March through early April 1995. The October release consisted of 105,452 supplementation fish at 25 fpp into the headwaters of the Salmon River and 25,025 reserve group at 28 fpp into the headwaters of the West Fork Yankee Fork. The spring 1995 releases included 100,141 supplementation fish at 24 fpp into the upper Salmon River, and 103,695 reserve group at 22 fpp released at the Sawtooth Fish Hatchery weir.

Fish release for East Fork stock BY93 smolts occurred in April 1995. A total of 48,845 smolts at 23 fpp were released into the East Fork Salmon River six miles above the weir.

Total BY93 chinook smolt release for fall of 1994 and spring of 1995 was 383,158. A summary of all smolt releases is shown in Appendix F.

Experimental Rearing

In October 1993, 126,000 Rapid River stock-eyed chinook eggs were received from Rapid River Fish Hatchery. These eggs were surplus hatchery origin and in excess to Rapid River Fish Hatchery production needs. The eggs were held until swim-up, with 123,792 fry being ponded (98% swim-up rate). In April 1994, 104,000 pre-smolts at 414 fish per pound were sent back to Rapid River Hatchery. The fish sent back to Rapid River were never exposed to raw river water. The remaining 15,624 fish were held at Sawtooth Fish Hatchery.

From May of 1994 to March of 1995, the 15,624 Rapid River chinook underwent several different rearing/handling tests. The purpose of the tests was to determine if an outbreak of "flag-tail" found in the BY92 Sawtooth Fish Hatchery spring chinook could be duplicated. Tests conducted included subjecting the fish to exposure to raw river water immediately after clipping, exposing the fish to baffled raceways, handling the fish multiple times and then exposing them to raw river water, and giving the fish multiple clips. None of the tests performed had any negative impact. No outbreaks of "flag-tail" occurred. The tests were completed in March of 1995 with 13,800 fish being destroyed.

1994 STEELHEAD TROUT

ABSTRACT

The Sawtooth Fish Hatchery trap and weir were put into operation on March 16, 1994 and closed May 9, 1994. A total of 338 adult steelhead *Oncorhynchus mykiss* (174 males and 164 females) were trapped at the Sawtooth Fish Hatchery weir. A total of 60 steelhead were released above the hatchery to spawn naturally. This included 33 males (one natural) and 27 females (five natural). There was no prespawning mortality at Sawtooth Fish Hatchery.

Spawning began on April 4, 1994 and continued through April 25, 1994. There were seven spawning days. A total of 136 females were spawned, yielding 725,205 green eggs for an average fecundity of 5,332 eggs per female. These green eggs resulted in 660,989 eyed eggs for an eye-up percentage of 91.1%. One hundred and thirty thousand eggs were kept at Sawtooth Fish Hatchery for experimental rearing, while the remaining 530,989 were shipped to Hagerman National Fish Hatchery for rearing.

The East Fork velocity barrier and trap were put into operation April 5, 1994 and ran through May 4, 1994. A total of 73 adult steelhead were trapped. This included 43 males and 30 females. Fish released above the weir to spawn naturally included five males (three natural) and five females (five natural).

Spawning operations began at the East Fork on April 18, 1994 and continued through April 25, 1994 with three spawning days. Twenty-five females were spawned, yielding 103,100 green eggs, for an average fecundity of 4,124 eggs per female. These green eggs resulted in 76,087 eyed eggs for an 73.8% eye-up rate. These eggs were shipped to Magic Valley Fish Hatchery for rearing.

. An additional 2,385,000 green eggs from Pahsimeroi Fish Hatchery were incubated at Sawtooth Fish Hatchery. These eggs eyed up at a 92.7% rate, yielding 2,211,983 eyed eggs. These eggs were shipped to the following hatcheries: Magic Valley Fish Hatchery received 799,316 eyed eggs; Hagerman National Fish Hatchery received 369,206 eyed eggs; and Niagara Springs Fish Hatchery received 1,043,401 swim-up fry.

All East Fork and Pahsimeroi, along with most of the Sawtooth Fish Hatchery stock eyed eggs were released as smolts during the spring of 1995. Sawtooth Fish Hatchery stock smolts were released at the following locations: Sawtooth Fish Hatchery acclimated release, 608,371; Sawtooth Fish Hatchery direct release, 76,635; and Torry's acclimated release, 64,167. In addition to the spring 1994 smolt releases, 34,000 Sawtooth Fish Hatchery smolts were released as catchable rainbow trout at Mormon Reservoir in July 1995 to provide a resident fishery. In May 1996, another 22,507 BY94 smolts being reared on a two-year rearing plan at Sawtooth Fish Hatchery were released. East Fork stock smolts numbering 65,000 along with an additional 108,955 Dworshak B-run smolts released below the East Fork trap. Dworshak-B smolts were also released at Herd Creek, 212,010; The East Fork dumpster site, 102,740; and Slate Creek, 215,935.

Authors:

Brent Snider
Fish Hatchery Manager II

Kurtis Schilling
Assistant Fish Hatchery Manager

FISH PRODUCTION

Steelhead Adult Collection

The Sawtooth Fish Hatchery weir and trap was put into operation on March 16, 1994 and closed May 9, 1994. The East Fork trap was put into operation April 5, 1994 and ran through May 4, 1994. The peak of the Sawtooth Fish Hatchery steelhead *Oncorhynchus mykiss* run occurred during the third week of April, while the peak of the East Fork run occurred during the third week of April (Appendices H and I).

Sawtooth Fish Hatchery trapped a total of 338 adult fish, which included 174 males and 164 females (Appendix R). Thirty-two of these fish had left ventral (LV) clips. Twenty-eight of the clipped fish had coded-wire tags (CWT). A total of 60 steelhead (33 males and 27 females) were released above the weir to spawn naturally. This included all natural fish (one male and five females).

The East Fork facility trapped 73 B-run adult fish, of which 43 were males and 30 were females (Appendix R). A total of five males (three natural) and five females (five natural) were released above the velocity barrier to spawn naturally. The length frequency distribution of steelhead from Sawtooth Fish Hatchery and the East Fork is shown in Appendices J and K.

Sawtooth Fish Hatchery had a male:female ratio of 51% males and 49% females. The East Fork's male:female ratio was 59% male and 41% female.

Using Kent Ball's, Idaho Department of Fish and Game (Department) Senior Fish Research Biologist, lengths for one- and two-ocean fish, steelhead returns by year class and sex are shown in Appendix S.

From the 28 Sawtooth Fish Hatchery CWT fish recovered, the information indicated 7 of the fish were one-ocean and 21 were two-ocean. From the three CWT fish recovered at the East Fork, one was a one-ocean, and two were two-ocean.

Adult Treatments

The returning adults at Sawtooth Fish Hatchery and East Fork Satellite are not treated or injected with any type of drug or chemicals prior to spawning.

Prespawning Mortality

Sawtooth Fish Hatchery and the East Fork facility had no prespawning mortality.

Spawning Operations

Sawtooth Fish Hatchery spawned steelhead on seven days from April 4 through April 25, 1994. Spawning took place at the East Fork on three days from April 18 through April 25, 1994. Both facilities used two males per female, pooling the sperm, then combining it with the eggs.

At Sawtooth Fish Hatchery, 277 fish were spawned, of which 136 were females. The East Fork facility spawned 63 fish, of which 25 were females. Using the Von Bayer egg-enumeration method, 725,205 green eggs were collected from Sawtooth Fish Hatchery fish (5,332 per female) and 103,100 green eggs were taken from East Fork fish (4,124 per female).

After fertilization, the eggs were rinsed of blood and sperm with well water. The eggs were water-hardened in a minimum 100 ppm solution of Argentine (10% iodine) solution for one hour before being put into Heath trays for incubation. All eggs tested negative for virus.

Incubation

After hardening in an Argentine solution, the green eggs were incubated at one females' eggs per Heath tray.

An additional 2,385,000 green eggs were received from Pahsimeroi Hatchery and incubated at Sawtooth Fish Hatchery. These eggs were incubated at two females per Heath tray.

All incubated eggs were treated with a 1,667 ppm 15-minute formalin flow-through treatment five times per week for fungal and bacterial control. Sawtooth Fish Hatchery's eggs eyed up at a 91.1% rate, yielding 660,989 eyed eggs. East Fork's eggs eyed up at a 73.8% rate, yielding 76,087 eyed eggs (Appendix D). Pahsimeroi eggs incubated at Sawtooth Fish Hatchery eyed up at a 92.7% rate, resulting in 2,211,923 eyed eggs.

Well temperatures varied from 39°F at the beginning of incubation to 47°F when the last fry were shipped. Ten temperature units per day was the average during the incubation period. Eye-up occurred at 360 TU's and the eggs were shocked at 380 TU's.

The eggs were shocked by putting them in a half-full 3-gallon bucket of water, then pouring them into a quarter-full bucket of water from about three feet high. One day after shocking, the eggs were machine-picked, using a Jenn-Sorter model JH machine, which picks and enumerates eggs. A day or two after picking, the eyed eggs are handpicked before transfer to the rearing hatcheries. The eggs were loaded at 50,000 to 100,000 eggs per 48-quart cooler of well water. Then the cooler was strapped shut and shipped.

We shipped 530,989 Sawtooth Fish Hatchery eyed eggs to Hagerman National Fish Hatchery. Magic Valley Fish Hatchery received 76,087 East Fork eyed eggs. The Pahsimeroi eyed eggs were shipped as follows: 799,316 to Magic Valley Fish Hatchery; and 369,206 to Hagerman National Fish Hatchery. Niagara Springs Fish Hatchery received 1,043,401 as swim-up fry (Appendix E).

Release Acclimation of BY94

For the fourth year in a row, steelhead smolts were held and acclimated at Sawtooth Fish Hatchery before final release. A total of 751,040 smolts were hauled from Hagerman National Hatchery and held in ten separate raceways starting from 20 to 24 days starting March 28, 1995. Total mortality during acclimation was 1,867 (0.3%). All of the fish were fed a maintenance diet of Biomoist 3.0 mm. The screens were removed on April 17, 1995 with less than 5% of the smolts moving out on their own in the first three days. The smolts were forced out of the raceways on April 21, 1995 (Appendix F).

Fish Marking

Fish marking was completed in the rearing hatcheries and is shown in Appendix F.

Two Year Experimental Rearing BY94 Steelhead

From spawning operations, 130,000 green Sawtooth Fish Hatchery steelhead eggs were taken and held at Sawtooth Fish Hatchery for experimental rearing. The eggs were from seven different lots and were representative of the entire egg take of 1994. There were two different objectives to be determined by the experimental rearing under three scenarios:

1. Determine the feasibility of rearing steelhead at Sawtooth Fish Hatchery to smolt size under a two-year rearing plan.

2. Acquire knowledge on the effects of whirling disease on steelhead at Sawtooth Fish Hatchery.

Scenario 1 involved 5,000 fish. From July 5, 1995 to February 2, 1996, these fish were held exclusively on raw river water. Mortalities were picked daily and grouped into 5 to 10 fish pools. A disease sampling protocol was set up by the Eagle Fish Health Laboratory and directed by a fish pathologist. On February 2, 1996, all the fish in this group were destroyed due to positive tests for whirling disease (Appendix C).

Scenario 2 involved 60,000 fish that were to be held exclusively on well water. Due to unexpected growth, it was determined the well-water reared fish were going to be too large for release into listed water in the spring of 1996. As a result, 34,000 fish were hauled to Mormon Reservoir to provide a resident fishery, and 24,000 fish were moved to an outside raceway on raw river water for slow growth. In the spring of 1996, 22,507 smolts (negative for whirling disease) were released into the Salmon River.

Scenario 3 involved 60,000 fish. These fish were moved from inside on well water to outside on raw river water in October of 1994. This group was sampled throughout their rearing cycle to detect whirling disease. In March of 1996, all fish in this group were destroyed due to positive tests for whirling disease (Appendix C).

CONCLUSIONS/RECOMMENDATIONS

East Fork Trap

As stated in last year's brood year report, the East Fork's adult returns are insufficient to meet egg needs or escapement goals. With the involved agency approvals, a lower weir and trap would boost our facility's adult numbers by capturing all the fish that drop out before reaching the trap. Another option would be not to clip the adipose fin off of East Fork stock fish. A ventral fin could be clipped off to identify these fish as East Fork stock. With the adipose fin attached, the East Fork stock would not be fished upon, giving us more broodstock potential. This would allow us to plant less Dworshak stock smolts, which are proven less successful than East Fork stock fish.

Sawtooth Fish Hatchery

If the returning number of adults show that acclimation is a viable program, then we should plan on implementing the program every spring. But if the numbers of adults show there is no difference or less returning "acclimated" adults, then we need to stop the program. Acclimation requires the hatchery to draw large amounts of water from the river, which also draw in emerging endangered natural chinook fry.

The experimental two-year rearing program provided a valuable experience for staff at Sawtooth Fish Hatchery, as well as documentation of extended rearing of steelhead at Sawtooth Fish Hatchery. Results indicate that pathogen-free well water quantity was the main limiting factor. Also, the well water temperature will produce a smolt too large for release into listed water. Space for rearing was adequate, however, this rearing space contributed to a high incidence of whirling disease due to the raw river water supply. Recommendations are not to rear two-year steelhead at Sawtooth Fish Hatchery.

APPENDICES

Appendix A. Sawtooth Fish Hatchery Chinook Smolt Releases and Hatchery Adult Returns.

Brood Year	Release Year	Number Released	Adult Returns[a] 3-year	4-year	5-year	Total Returns	%
			SAWTOOTH FISH HATCHERY				
1979	1981	None	-	-	291	-	inc.
1980	1982	None	17	66	165	248	inc.
1981	1983	185,375	49	1,182	796	2,027	1.08
1982	1984	230,550	292	922	875	2,086	0.91
1983	1985	420,060	51	452	1,318	1,821	0.43
1984	1986	347,484	17	86	190	293	0.08
1985	1987	1,185, 061	80	286	164	530	0.05
1986	87-88	1,705,500	412	1,212	297	1,921	0.11
1987	88-89	2,092,000	112	201	63	376	0.02
1988	89-90	1,895,600	68	496	480	1,044	0.055
1989	90-91	652,600	45	78	27	150	0.023
1990	91-92	1,273,400	29	63	28	98	0.008
1991	92-93	774,583	6	15	(1996)	-	inc.
1992	93-94	213,830	16	(1996)	(1997)	-	inc.
1993	94-95	334,313	(1996)	(1997)	(1998)	-	inc
			EAST FORK				
1979	1981	-	-	-	69	69	inc.
1980	1982	-	-	26	59	85	inc.
1981	1983	-	-	193	102	317	inc.
1982	1984	-	-	87	181	268	inc.
1983	1985	-	22	90	519	631	inc.
1984	1986	108,700	1	23	51	75	.06
1985	1987	195,100	6	55	27	88	.045
1986	1988	249,200	22	106	32	160	.064
1987	1989	305,300	12	23	23	58	.019
1988	1990	514,600	7	27	65	99	.019
1989	1991	98,300	15	18	13	46	.046
1990	1992	79,300	6	2	6	14	.017
1991	1993	35,172	0	0	(1996)	-	inc.
1992	1994	12,368	0	(1996)	(1997)	-	inc.
1993	1995	48,845	(1996)	(1997)	(1998)	-	inc.

[a] Age classes based upon the following lengths:
three-year-old: $\leq$ 64 cm
four-year-old: 64 to 82 cm
five-year-old: >82 cm

Adult returns include an unknown number of natural fish.

Appendix B. Water Quality Analysis of the Salmon River taken by Sawtooth Fish Hatchery.

Nutrients (mg/L)	1993	1985
T. Ammonia as N	0.043	0.045
T. NO2 + NO3 as N	0.073	0.088
T. Kjeldahl Nitrogen as N	<.05	0.26
T. Phosphorus as P	<.05	0.02
Ortho Phosphate as P	0.019	<.003
Minerals(mg/L)		
Sp. Conductance (umhos/cm)	157	135
Hardness as CaCO3	68	62
T. Alkalinity as CaCO3	74	63
Bicarbonate Alk. as CaCO3	74	63
Calcium	24	20.8
Magnesium	1.9	1.8
Sodium	7.0	3.8
Potassium	0.7	<1
Fluoride	0.85	0.58
Sulphate as SO4	5	<6
Total Metals(ug/L)		
Arsenic, Total	<10	<10
Boron, Total	<80	1
Cadmium, Total	<1	<1
Chromium, +6	<10	<50
Chromium, Total	<10	<50
Copper, Total	<10	<10
Iron, Total	20	120
Lead, Total	<5	<50
Manganese, Total	<10	10
Mercury, Total	<0.5	<0.5
Nickel, Total	<10	<50
Silver, Total	<1	<1
Zinc, Total	<2	<1
Miscellaneous		
Turbidity (NTU)	<1	1.8
pH (SU)	8.0	8.1
Total Cyanide (mg/L)	<.005	<.005
Total Residue	-	97

Appendix C. Results of Disease Sampling at Sawtooth Fish Hatchery.

Case #	Stock	Date	Data
			By93 Juvenile Chinook
93-485	EF	11/12/93	IHN 0/10, IPN 0/10, BKD 0/10, FUR, ERM, CWD 0/8
93-484	Saw	12/02/93	IHN 0/10, IPN 0/10, BKD 0/10, FUR, ERM, CWD 0/8
94-096	Saw	03/14/94	IHN 0/10, IPN 0/10, BKD 0/10, FUR, ERM, CWD 0/8
94-255	EF	06/23/94	IHN 0/10, IPN 0/10, BKD 0/10, ERM, CWD 0/4
94-256	Saw	06/23/94	IHN 0/10, IPN 0/10, BKD 0/10, ERM, CWD 0/4
94-299	Saw	07/20/94	IHN 0/10, IPN 0/10, BKD 0/10, FUR, ERM, CWD 0/4
94-300	EF	07/20/94	IHN 0/10, IPN 0/10, BKD 0/10, FUR, ERM, CWD 0/4
94-313	Saw	08/30/94	IHN 0/8, IPN 0/8, FUR, ERM, CWD, CS, 0/8
94-355	Saw	08/30/94	IHN 0/12, IPN 0/12
94-408	Saw	09/28/94	IHN 0/1, IPN 0/1
94-482	EF	09/28/94	BKD 6/6
94-499	Saw	10/26/94	IHN 0/10, IPN 0/10, Elisa 2/2 very low
94-497	EF	10/26/94	IHN 0/5, IPN 0/5, WHD 0/5, BKD 5/5 fat
94-496B	Saw	11/01/94	IHN 0/10, IPN 0/10, Elisa 1/4 low, WHD 0/5
94-546	Saw	11/16/94	IHN 0/10, IPN 0/10, BKD 0/10, ERM, FUR, CWD, 0/8
94-547	EF	11/16/94	IHN 0/10, IPN 0/10, BKD 0/10, ERM, FUR, CWD, 0/8
94-632	Saw	12/28/94	IHN 0/11, IPN 0/11, BKD 5/11 fat, ERM, FUR, CWD, 0/8
94-659	Saw	01/30/95	IHN 0/10, IPN 0/10, BKD 0/10, FUR, ERM, CWD 0/4
94-660	EF	01/30/95	IHN 0/10, IPN 0/10, BKD 0/10, FUR, ERM, CWD 0/4
95-049	EF	03/01/95	IHN 0/10, IPN 0/10, BKD 0/10
95-050	Saw	03/01/95	IHN 0/10. IPN 0/10, BKD 1/10 fat
95-093	Saw	04/12/95	IHN 0/20, IPN 0/20, BKD 3/4; 2 low Elisa, WHD 0/20
95-092	EF	06/07/95	IHN 0/20, IPN 0/20, BKD 4/4
			Return Year 92 Chinook Broodstock
93-281	Saw	08/25/93	IHN 0/1, IPN 0/1, BKD 0/1, WHD, CS, 0/1
93-311	Saw	09/07/93	IHN 0/6, IPN O/6
93-315	Saw	08/05/93	IHN 0/8, IPN 0/8, BKD 9/12 Elisa 7 low, 1 mod 1 high WHD 0/1 CS 0/3
93-318	Saw	08/05/93	BKD 0/3, WHD, CS 0/3
93-325	Saw	09/28/93	IHN 0/3, IPN 0/3, BKD 3/3 2 Elisa low, 1 high
93-328	EF	08/13/93	IHN 0/1, IPN 0/1, BKD 1/4 Elisa low, CS 1/3
93-327	Saw	09/28/93	IHN 0/8, IPN 0/8, BKD 3/8 Elisa lows
93-346	Saw	08/05/93	IHN 0/10, IPN 0/10, BKD 4/10 Elisa 3 low, 1 mod, WHD 1/1, CS 1/10
93-418	EF	11/09/93	IHN 0/1, IPN 0/1, BKD 2/2 Elisa high, WHD 0/1
			Return Year 93 Steelhead Broodstock
94-183	Saw	04/04/94	Viro 0/6
94-193	Saw	04/07/94	Viro 0/2
94-197	Saw	04/11/94	Viro 0/5
94-214	Saw	04/14/94	Viro 0/9
94-220	Saw	04/18/94	Viro 0/43
94-221	EF	04/18/94	Viro 0/17
94-225	Saw	04/20/94	Viro 0/39
94-226	EF	04/21/94	Viro 0/5
94-234	EF	04/25/94	Viro 0/4
94-235	Saw	04/25/94	Vir0 0/3

Appendix C. Results of Disease Sampling at Sawtooth Fish Hatchery.

2 Year BY94 Steelhead Rearing Experiment

Case #	Stock	Date	Data
94-556	Saw	10/12/94	WHD 3/6 confirmed via histo
95-048	Saw	01/31/95	IHN 0/10, IPN 0/10, BKD 0/10
95-354	Saw	08/08/95	WHD 0/6, suspicious pathology
95-405	Saw	09/03/95	IHN 0/2, IPN 0/2, FUR, ERM, CWD, WHD 0/2
95-585	Saw	12/12/95	WHD 18/20 quantitative eval.
96-034	Saw	01/30/96	WHD 3/26 low prevalence

Appendix D. Survival Table for Chinook (BY 93) and Steelhead (BY 94) from Green Eggs to Released Smolts, at Sawtooth Fish Hatchery and East Fork Sites.

Green egg number	Eyed egg number	Percent survival	Released smolts	Percent survival from green
		CHINOOK		
Sawtooth Fish Hatchery Fish				
369,340	341,641	92.5	334,313	90
East Fork fish				
59.152	52.000	87.9	48.845	82
428,492	393,641	91.8	383,158	89
		STEELHEAD		
Sawtooth Fish Hatchery Fish				
725,205	660,989	91	[a]539, 771	74
East Fork fish				
103.100	76.087	74	65.000	63
828,205	737,076	89	604,771	73

All steelhead raised at other hatcheries.

[a] Includes 34,000 BY94 steelhead planted into Mormon Reservoir and 22,507 smolts released in spring of 1996.

Appendix E. Production Cost Table at Sawtooth Fish Hatchery (Includes Chinook BY93 and Steelhead BY94).

CHINOOK

Smolt Number	Lbs. feed	Cost feed	Lbs of smolts	C	Total cost	Cost per 1.000	Cost per lb
Sawtooth Fish Hatchery							
334,313	20,508	$14,003	13,995	1.5	$300,359	$899.27	$21.46
East Fork							
48,845	3,146	$2,148	1,920	1.5	$75,090	$1.537.31	$39.10
383,158	23,654	$16,251	15,915	1.5	$375,449	$979.88	$23.59

STEELHEAD

Green eggs	Eyed eggs	Total cost	Cost per 1,000 eyed eggs
Sawtooth Fish Hatchery			
725,205	660,989	$43,802	$66.26
East Fork			
103,100	76,087	$31,287	$411.20
Pahsimeroi			
2,385,000	2.211,983	$50,060	$22.63
3,213,305	2,949,059	$125,150	$42.43

Note: Total costs less capital outlay. Costs include operating East Fork fish trap and running wells for entire rearing period.

Appendix F. Summary of Smolt Releases and Marks at Sawtooth Fish Hatchery.

Release Date	Number	Marks-CWT	# PIT	fpp	Release Site	Purpose
			STEELHEAD			
Sawtooth Fish Hatchery/Pahsimeroi stock - all fish reared by Hagerman National Hatchery						
03/28/95	58,561	Ad-10-45-10,11,12	300	5.4	SFH weir	Acclimation
03/28/95	31,826	Ad-none		5.7	SFH weir	Acclimation
03/29/95	64,167	Ad-10-45-13,14,15	300	5.8	Torry's	Supplementation
03/29/95	32,661	Ad-none		5.3	SFH weir	Acclimation
03/30/95	92,185	Ad-none		5.2	SFH Weir	Acclimation
03/31/95	31,224	Ad-none		5.2	SFH weir	Acclimation
03/31/95	68,429	Ad-10-45-,18,19,20	300	5.6	SFH weir	Acclimation
04/04/95	87,630	Ad-none		4.9	SFH weir	Acclimation
04/05/95	86,842	Ad-none		4.7	SFH weir	Acclimation
04/06/95	59,029	Ad-none		4.7	SFH weir	Acclimation
04/07/95	59,984	Ad-none		4.5	SFH weir	Acclimation
04/17/95	76,635	Ad-10-45-6,7,8	300	4.9	SFH weir	Direct release
Total	749,173					
East Fork Stock - All fish reared by Magic Valley Hatchery						
04/25/95	65,000	Ad-10-20-24	301	5.0	EF abv weir	Contribution
Total	65,000					

Mark Type	CWT Code	# PIT	# Fish Released	Release Site	Release Date	Purpose
			CHINOOK			
Ad	none	1,000	25,025	WFYankeeFork	10/20/94	Production
Lv	none		17,595	East Fork	04/03/95	BKD Group
Lv	none	500	31,250	East Fork	03/28/95	Supplementation
Ad	none	1,000	75,917	SFH weir	04/05/95	Production
Ad,Lv	none	500	27,778	SFH weir	04/07/95	BKD Group
Rv	none	1,600	205,593	Upper Salmon R	10/24/94	Supplementation
Totals		4,600	383,158		03/27/95	

Appendix G. Sawtooth Fish Hatchery Spring Chinook Length Frequency Distribution, 1993.

Fish Length (cm)	Fish Trapped	Males	Females
37	1	1	0
45	4	4	0
47	1	1	0
48	2	2	0
50	3	3	0
51	3	3	0
52	1	1	0
53	4	4	0
54	2	2	0
56	1	1	0
57	1	1	0
60	1	1	0
63	2	2	0
64	3	3	0
65	3	3	0
66	2	2	0
67	6	6	0
68	6	5	1
69	6	3	3
70	5	3	2
71	4	3	1
72	3	2	1
73	4	2	2
74	3	0	3
75	3	1	2
76	8	3	5
77	3	2	1
78	2	2	0
79	4	1	3
80	4	1	3
81	6	3	3
82	6	3	3
83	10	2	8
84	17	5	12
85	18	2	16
86	21	5	16
87	23	3	20
88	37	6	31
89	36	8	28
90	47	18	29
91	31	5	26
92	37	16	21
93	30	18	12
94	24	16	8
95	30	22	8
96	17	12	5
97	14	13	1

Appendix G. Sawtooth Fish Hatchery Spring Chinook Length Frequency Distribution, 1993.

Fish Length (cm)	Fish Trapped	Males	Females
98	19	18	1
99	15	11	4
100	21	20	1
101	10	10	0
102	4	4	0
103	5	5	0
104	3	3	0
150	3	3	0
106	2	2	0
107	3	3	0
108	1	1	0
110	1	1	0
115	1	1	0
Totals	587	307	280

Appendix H. East Fork Spring Chinook Length Frequency Distribution, 1993.

Fish Length (cm)	Fish Trapped	Males	Females
57	1	1	0
61	1	1	0
62	2	1	1
64	2	2	0
65	2	2	0
67	2	2	0
68	1	1	0
72	2	2	0
73	1	1	0
75	1	0	1
76	3	2	1
77	1	0	1
78	2	1	1
79	1	1	0
81	3	1	2
85	3	2	1
86	1	0	1
87	5	0	5
88	3	1	2
89	2	0	2
90	6	1	5
91	3	0	3
92	6	4	2
93	1	1	0
94	1	1	0
95	4	3	1
96	4	3	1
97	2	1	1
98	1	1	0
99	6	5	1
100	5	5	0
101	4	3	1
102	4	4	0
103	1	1	0
104	3	3	0
Totals	90	57	33

Appendix I. CWT Recoveries, Sawtooth Fish Hatchery and East Fork Spring Chinook, 1993.

Sex	Length(cm)	Mark	Sex	Length(cm)	Mark
Sawtooth Fish Hatchery (n=66); 50 ad, 15 lv, 1 rv					
m	70	ad	m	67	ad
m	102	ad	f	89	ad
f	81	ad	m	99	ad
f	92	ad	m	96	ad
f	90	ad	f	88	ad
f	89	ad	f	91	ad
f	91	ad	m	100	ad
f.	76	ad	f	92	ad
m	95	ad	f	81	ad
m	78	ad	m	99	ad
m	94	ad	f	76	ad
f	90	ad	f	91	ad
m	81	ad	m	82	ad
f	69	ad	f	87	ad
f	78	rv	f	94	ad
f	85	ad	f	89	ad
f	77	ad	m	86	ad
m	49	lv	m	49	lv
f	72	ad	f	81	ad
m	48	lv	f	90	ad
m	98	ad	f	66	ad
m	95	ad	m	78	ad
m	49	lv	m	63	lv
m	45	lv	m	45	lv
m	48	ad	m	50	lv
m	55	lv	m	60	ad
m	77	ad	m	54	ad
m	50	lv	m	43	lv
m	47	lv	m	44	ad
m	50	lv	m	48	lv
m	73	ad	m	60	ad
m	46	ad	m	52	lv
f	83	ad	f	87	ad
East Fork (N = 3) 3 ad					
f	85	ad	f	90	ad
m	93	ad			

Appendix J. Sawtooth Fish Hatchery Steelhead Length Frequency Distribution, Return Year 1994.

Length(cm)	Hatchery Males	Natural Males	Hatchery Females	Natural Females	Total
53	1	0	0	0	1
54	2	0	0	0	2
55	6	0	2	0	8
56	5	0	0	0	5
57	11	0	4	0	15
58	10	0	4	0	14
59	7	0	2	0	9
60	9	0	5	0	14
61	7	1	4	0	12
62	3	0	2	0	5
63	4	0	3	0	7
64	4	0	7	0	11
65	1	0	12	0	13
66	6	0	8	1	15
67	3	0	11	0	14
68	6	0	14	0	20
69	10	0	23	1	34
70	13	0	20	0	33
71	13	0	11	0	24
72	13	0	7	2	22
73	12	0	7	0	19
74	10	0	5	1	16
75	6	0	3	0	9
76	2	0	3	0	5
77	2	0	0	0	2
78	3	0	0	0	3
79	0	0	0	0	0
80	2	0	0	0	2
81	0	0	0	0	0
82	1	0	1	0	2
87	1	0	0	0	1
Totals	173	1	159	5	338

Appendix K. East Fork Steelhead Length Frequency Distribution, Return Year 1994.

Length(cm)	Hatchery Males	Natural Males	Hatchery Females	Natural Females	Total
59	0	1	0	0	1
60	0	0	1	0	1
61	1	0	0	0	1
62	2	0	0	0	2
64	2	0	0	0	2
65	1	1	0	0	2
66	2	0	0	0	2
70	0	0	1	0	1
71	2	0	0	0	2
72	2	0	1	0	3
73	2	0	2	0	4
74	0	0	4	0	4
75	3	0	7	0	10
76	3	0	2	1	6
77	7	0	1	1	9
78	6	0	2	0	8
79	2	0	2	0	4
80	2	0	0	1	3
82	2	0	1	2	5
83	1	1	0	0	2
84	0	1	0	0	1
Totals	40	3	25	5	73

Appendix L. Lengths of Brood Year 1993 Adult Chinook Salmon Released at Sawtooth Fish Hatchery.

Fork Length (Cm)	Males	Females
45	1	0
46	0	0
47	0	0
48	0	0
50	2	0
51	0	0
52	1	0
53	0	0
54	1	0
55	0	0
56	1	0
57	0	0
58	0	0
59	0	0
60	0	0
61	0	0
62	0	0
63	0	0
64	1	0
65	3	0
66	1	0
67	2	0
68	1	0
69	3	3
70	3	2
71	2	0
72	2	1
73	2	2
74	0	2
75	1	2
76	2	2
77	0	0
78	1	0
79	0	3
80	1	1
81	2	2
82	2	3
83	0	5
84	3	10
85	2	14
86	4	13
87	3	17
88	5	18
89	6	21
90	16	21

Appendix L. Lengths of Brood Year 1993 Adult Chinook Salmon Released at Sawtooth Fish Hatchery.

Fork Length (Cm)	Males	Females
91	4	22
92	15	17
93	14	9
94	12	7
95	11	4
96	9	3
97	7	0
98	15	1
99	9	3
100	14	1
101	8	0
102	4	0
103	4	0
104	3	0
105	3	0
106	2	0
107	3	0
108	1	0
110	1	0
115	1	0
Totals:	214	209

Appendix M. Lengths of Brood Year 1993 Adult Chinook Salmon Released at East Fork.

Fork Length (Cm)	Males	Females
57	1	0
58	0	0
59	0	0
60	0	0
61	1	0
62	1	1
63	0	0
64	2	0
65	2	0
66	0	0
67	2	0
68	1	0
69	0	0
70	0	0
71	0	0
72	2	0
73	0	0
74	0	0
75	0	0
76	2	1
77	0	1
78	0	0
79	0	0
80	0	0
81	1	2
82	0	0
83	0	0
84	0	0
85	2	0
86	0	1
87	0	4
88	0	0
89	0	2
90	1	2
91	0	2
92	3	2
93	0	0
94	1	0
95	3	0
96	2	1
97	0	1
98	0	0
99	4	0
100	4	0
101	3	1
102	4	0
103	0	0
104+	2	0
Totals	44	21

Appendix N. Age-Class Totals from All Trapped Chinook, Return Year 1993 at Sawtooth Fish Hatchery.

	Length (fk)	Year Class	Number
Sawtooth Fish Hatchery			
Males	≤ 64 cm	3-year-old	29
	64-82 cm	4-year-old	45
	> 82 cm	5-year-old	233
Females	≤64 cm	3-year-old	0
	64-82 cm	4-year-old	33
	> 82 cm	5-year-old	247
		Total	587
East Fork			
Males	≤ 64 cm	3-year-old	5
	64-82 cm	4-year-old	13
	> 82 cm	5-year-old	39
Females	≤ 64 cm	3-year-old	1
	64-82 cm	4-year-old	6
	> 82 cm	5-year-old	26
		Total	90

Appendix O. Age-Class Breakdown by Released Chinook, Return Year 1993.

	Length (fk)	Age-Class	Number
Sawtooth Fish Hatchery			
Males	≤64 cm	3-year-old	7
	64-82 cm	4-year-old	28
	> 82 cm	5-year-old	79
Females	≤ 82 cm	4-year-old	23
	> 82 cm	5-year-old	186
		Total	423
East Fork			
Males	≤ 64 cm	3-year-old	5
	64-82 cm	4-year-old	10
	>82 cm	5-year-old	29
Females	≤ 82 cm	4-year-old	5
	>82 cm	5-year-old	16
		Total	65

Appendix P. Feed Schedule for Sawtooth Fish Hatchery Spring Chinook, BY93.

Fpp	% BW Fed	Feed Size	Timing
su ---800	.035	#2/#3 str	12/93 - 1/16/94
800---500	.033	#3 str	01/16 - 02/28
500---400	.028	1.0 mm	03/01 - 03/15
400---350	.025	1.0/1.3 mm	03/16 - 04/01
350---300	.023	1.3 mm	04/02 - 04/14
300---250	.022	1.3 mm	04/15 - 06/01
250---150	.024	1.5 mm	06/02 - 06/28
150---110	.024	1.5 mm	06/29 - 07/04
110----90	.028	1.5 mm	07/05 - 08/15
90-----50	.030	2.5 mm	08/16 - 09/25
50-----25	.028	2.5 mm	09/26 - 10/15
< ----25	Maintenance	3.0 mm	10/16 - release

Appendix Q. Summary of Marked Chinook Released, Return Year 1993.

*Total supplementation release	205,539
*Total WF Yankee Fork release	25,025
*Total Sawtooth Fish Hatchery weir release	103,695
*Total East Fork release	48,845
CWT plus PIT tags	4,547
LV clip plus PIT tags	1,985
RV clip plus PIT tags	1,590
AD clip[only plus PIT tags	999
*Total Release	383,158

Appendix R. Steelhead Returns by Year Class[a] and Sex, Return Year 1994.

Sawtooth Fish Hatchery	
2-year-old males	86
3- or 4-year-old males	88
Total	174
2-year-old females	46
3- or 4-year-old females	118
Total	164
East Fork	
2-year-old males	16
3- or 4-year-old males	27
Total	43
2-year-old females	1
.3- or 4-year-old females	29
Total	30

[a] These figures are based on Kent Ball's criteria for aging steelhead, as described in Appendix V.

Appendix S. Criteria for Aging Steelhead, from Kent Ball, Idaho Department of Fish and Game.

"A" male	≤68 cm	2-year-old
	>68 cm	3- or 4-year-old
"A" female	≤65 cm	2-year-old
	>65 cm	3- or 4-year-old
"B" male	≤73 cm	2-year-old
	>73 cm	3- or 4-year-old
"B" female	≤68 cm	2-year-old
	>68 cm	3- or 4-year-old

Appendix T. Released Steelhead by Year Class and Sex, Return Year 1994

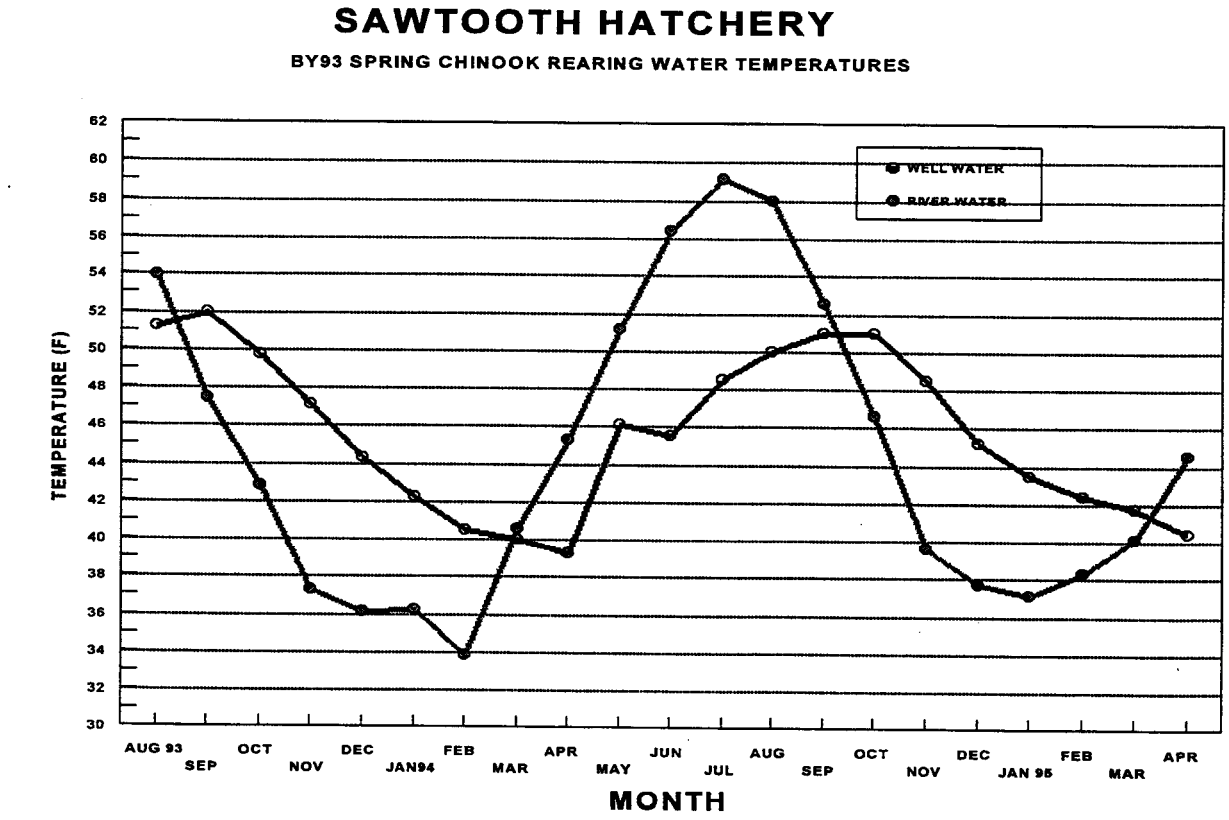
Sawtooth Fish Hatchery

Males	2-year-old	18	Females	2-year-old	5
	3- or 4-year-old	15		3- or 4-year-old	22
TOTAL		33			27

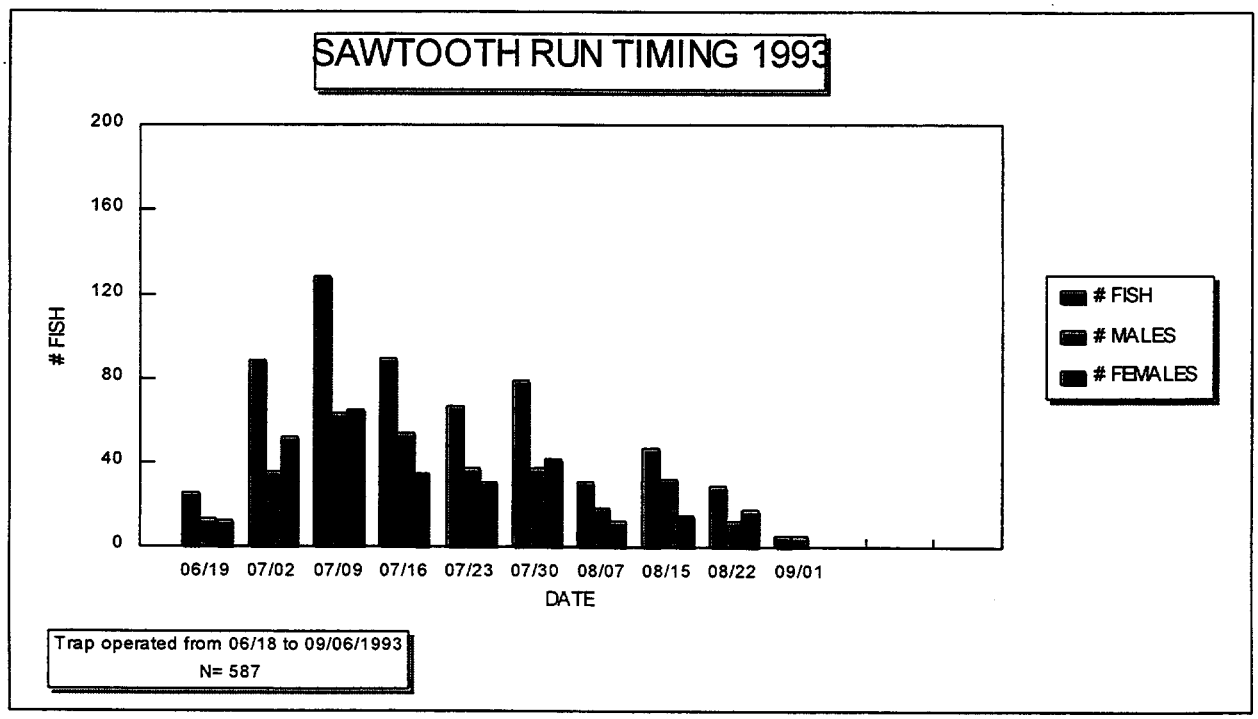
East Fork

Males	2-year-old	3	Females	2-year-old	0
	3- or 4-year-old	2		3- or 4-year-old	5
TOTAL		5			5

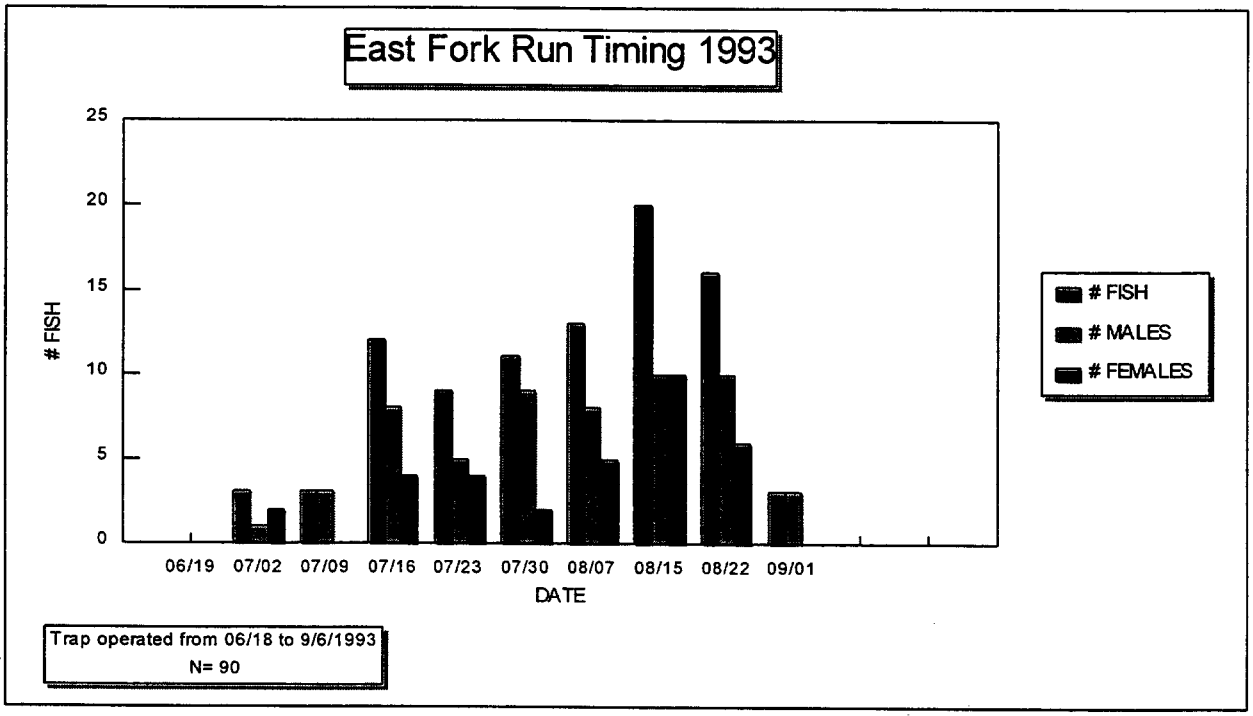
Appendix U. Rearing Water Temperatures, BY93 Sawtooth Spring Chinook, BY93.



Appendix V. Adult Spring Chinook Salmon Run Timing at Sawtooth Fish Hatchery, Return Year.



Appendix W. Adult Spring Chinook Run Timing at East Fork, Return Year 1993.



Submitted by:

Brent Snider Hatchery Manager II

Kurtis Schilling
Assistant Hatchery Manager

Approved by:

Virgil K. Moore, Chief
Bureau of Fisheries

Tom Rogers
Fish Hatchery Supervisor